Net-Zero America - Maryland data

October 29, 2021 (updated November 17, 2023)

See the Data Sheet Guide for explanations of the contents of this document. The data herein underlie graphs and tables found in Princeton's Net-Zero America report:

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Table 1: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		28	20.9	13.9	12.6	7.41	3.09
Premature deaths from air pollution - Mobile - On-Road (deaths)		246	229	173	100	44.8	16.5
Premature deaths from air pollution - Gas Stations (deaths)		17.5	16.1	12	6.99	3.22	1.34
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.2	26.2	17.3	9.45	4.49	1.96
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16	13	8.78	5	2.15	0.668
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.19	3.77	2.93	2	1.18	0.679
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35	30	21.2	12.8	7.49	4.58
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.17	7.3	5.23	3.42	2.23	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.21	1.83	1.44	1.06	0.704
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.17	0.672	0.669	0.661	0.671	0.664
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		54.1	49.3	42.7	33.1	23.3	13.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		248	185	123	112	65.6	27.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,187	2,036	1,542	889	398	147
Monetary damages from air pollution - Gas Stations (million $2019)		155	142	106	61.9	28.6	11.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		286	232	154	83.8	39.8	17.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		142	115	77.8	44.3	19.1	5.92
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.1	33.4	25.9	17.7	10.5	6.02
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		310	265	188	113	66.3	40.5

Table 1: *E+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.2	64.6	46.3	30.2	19.8	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	19.6	16.2	12.7	9.42	6.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.4	5.93	5.91	5.84	5.92	5.86
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		480	438	379	294	207	123

Table 2: *E+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		49.8	101	38.7	30	22	337
By economic sector - Construction (jobs)		8,186	7,158	8,759	8,839	10,024	16,606
By economic sector - Manufacturing (jobs)		1,995	2,739	2,865	2,620	3,059	4,315
By economic sector - Mining (jobs)		1,387	923	589	350	190	100
By economic sector - Other (jobs)		1,189	1,070	1,356	1,467	1,712	2,649
By economic sector - Pipeline (jobs)		304	256	280	153	102	100
By economic sector - Professional (jobs)		3,402	3,072	3,620	3,926	4,519	7,613
By economic sector - Trade (jobs)		2,518	2,146	2,441	2,575	2,950	4,772
By economic sector - Utilities (jobs)		5,913	5,732	7,685	8,514	10,230	18,603
By resource sector - Biomass (jobs)		214	279	110	90.3	80.4	1,438
By resource sector - CO2 (jobs)		0	0	655	56	72.2	326
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		7,214	7,858	11,725	13,620	17,971	35,860
By resource sector - Natural Gas (jobs)		3,257	2,606	2,312	2,623	1,856	1,628
By resource sector - Nuclear (jobs)		923	908	894	880	866	677
By resource sector - Oil (jobs)		3,071	2,410	1,678	1,089	673	385
By resource sector - Solar (jobs)		9,148	8,282	9,383	8,809	9,300	12,424
By resource sector - Wind (jobs)		315	642	876	1,307	1,990	2,356
By education level - All sectors - High school diploma or less (jobs)		10,609	9,880	11,786	12,069	13,919	23,547
By education level - All sectors - Associates degree or some college (jobs)		7,901	7,370	8,922	9,245	10,690	17,942
By education level - All sectors - Bachelors degree (jobs)		5,016	4,644	5,404	5,570	6,375	10,568
By education level - All sectors - Masters or professional degree (jobs)		1,235	1,138	1,334	1,394	1,602	2,678
By education level - All sectors - Doctoral degree (jobs)		184	165	188	197	222	362
Related work experience - All sectors - None (jobs)		3,619	3,369	4,041	4,174	4,816	8,141
Related work experience - All sectors - Up to 1 year (jobs)		5,019	4,679	5,550	5,687	6,556	11,027
Related work experience - All sectors - 1 to 4 years (jobs)		8,970	8,327	9,906	10,221	11,775	19,775
Related work experience - All sectors - 4 to 10 years (jobs)		5,830	5,405	6,458	6,666	7,671	12,840
Related work experience - All sectors - Over 10 years (jobs)		1,506	1,416	1,679	1,726	1,989	3,313
On-the-Job Training - All sectors - None (jobs)		1,388	1,274	1,494	1,532	1,752	2,897
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,172	15,111	17,873	18,392	21,199	35,625

Table 2: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,342	4,953	5,992	6,195	7,149	12,014
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,797	1,628	2,007	2,087	2,404	4,073
On-the-Job Training - All sectors - Over 10 years (jobs)		247	229	267	268	303	486
On-Site or In-Plant Training - All sectors - None (jobs)		4,050	3,765	4,447	4,571	5,243	8,711
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,732	13,749	16,297	16,778	19,349	32,542
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,134	3,837	4,630	4,781	5,519	9,282
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,813	1,644	2,010	2,084	2,395	4,048
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		216	202	249	259	301	513
Wage income - All (million $2019)		1,443	1,356	1,635	1,712	1,999	3,410

Table 3: *E+ scenario - IMPACTS - Fossil fuel industries*

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		69.1	59.1	44.6	31.1	20.6	12.5
Oil consumption - Cumulative (million bbls)							1,382
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		233	196	157	118	74.6	51.7
Natural gas consumption - Cumulative (tcf)							4,741
Natural gas production - Annual (tcf)		0.029	0.028	0.024	0.02	0.016	0.013

Table 4: *E+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167

Table 5: *E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.99	3.04	6	6.39	5.4	5.63

Table 6: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	65.5	406	746	1,938	3,129	4,082	5,034
Vehicle stocks - LDV – All others (1000 units)	4,197	3,997	3,796	2,766	1,737	983	228
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		800	2,073	3,321	5,046	5,475	5,229
Public EV charging plugs - DC Fast (1000 units)	0.402		1.31		5.5		8.84
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212

Table 7: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Sales of space heating units - Electric Resistance (%)	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35
Sales of water heating units - Electric Heat Pump (%)	0	9.19	48.7	57.6	58	58	58
Sales of water heating units - Electric Resistance (%)	35.7	51	42.2	40.3	40.2	40.2	40.2
Sales of water heating units - Gas Furnace (%)	59.5	36.5	7.04	0.317	0.002	0	0
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84
Sales of cooking units - Electric Resistance (%)	59.2	67.9	94.5	99.7	100	100	100
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.71				

Table 8: *E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.22	28.1	70.4	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.3	18.3	3.58	1.9	1.86	1.85
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Sales of water heating units - Electric Resistance (%)	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Sales of water heating units - Gas (%)	93	74.5	14.3	0.646	0.003	0	0
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,776	24,347				

Table 9: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,790	7,271	7,956	10,343	10,506	10,333
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	1,829	1,829	1,829	911
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	809	4,104	5,824	7,813	8,889	10,195	10,378
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	4,288	15,370
Installed renewables - Solar - Constrained land use assumptions (MW)	532	3,826	4,335	5,450	6,017	7,371	7,986
Installed renewables - Wind - Constrained land use assumptions (MW)	191	191	191	263	2,069	2,069	2,069
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	989	15,372

Table 9: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		4.41	2.06	2.19	1.12	1.28	0.169
Capital invested - Offshore Wind - Base (billion $2018)		0	0	0	0	6.33	14.7
Capital invested - Solar PV - Constrained (billion $2018)		2.9	0.138	0.35	0	1.23	1.46
Capital invested - Wind - Constrained (billion $2018)		0	0	0.457	3.71	0	0
Capital invested - Offshore Wind - Constrained (billion $2018)		0	0	0	0	1.46	19.1
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

Table 10: *E+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,524	7,647	10,854	14,593	16,586	18,938	19,283
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	19,084	72,114
Solar - Constrained land use assumptions (GWh)	845	6,984	7,931	9,956	10,973	13,309	14,379
Wind - Constrained land use assumptions (GWh)	786	786	786	1,049	7,048	7,048	7,048
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	19,084	72,114
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

Table 11: *E+ scenario - PILLAR 3: Clean fuels - Bioenergy*

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	4
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	0	0	4,833
Biomass purchases (million $2018/y)		0	0	0	0	0	222

Table 12: *E+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	3.32	3.42	9.75
Annual - BECCS (MMT)		0	0	0	0	0	6.21

Table 12: *E+ scenario - PILLAR 4: CCUS - CO2 capture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	0	3.32	6.74	16.5
Cumulative - BECCS (MMT)		0	0	0	0	0	6.21
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

Table 13: *E+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	112	112	112	112
Spur (km)		0	0	0	85.1	85.1	317
All (km)		0	0	112	197	197	429
Cumulative investment - Trunk (million $2018)		0	0	667	667	667	667
Cumulative investment - Spur (million $2018)		0	0	0	81.3	82.7	294
Cumulative investment - All (million $2018)		0	0	667	748	749	961

Table 14: *E+ scenario - PILLAR 4: CCUS - CO2 storage*

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million $2020)		0	0	0	0	0	0
Wells and facilities construction costs (million $2020)		0	0	0	0	0	0

Table 15: *E+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922

Table 15: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110

Table 15: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

Table 16: *E+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

Table 17: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		28	18.3	8.27	3.91	1.32	0.863
Premature deaths from air pollution - Mobile - On-Road (deaths)		251	254	247	222	176	120
Premature deaths from air pollution - Gas Stations (deaths)		18	18.2	17.5	15.7	12.4	8.42

Table 17: *E- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.5	29.9	26.4	21.5	15.7	10.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16.3	15.7	15.2	13.3	9.81	6.08
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.25	4.29	4.26	3.91	3.16	2.31
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35.3	34.5	32.7	28.5	22.4	16.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.21	7.97	6.74	5.46	4.39	3.48
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.37	2.14	1.9	1.67	1.43
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.14	0.673	0.674	0.669	0.672	0.649
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		53.9	46.5	37.2	30.2	25.2	18.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		248	162	73.2	34.7	11.7	7.64
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,231	2,262	2,199	1,975	1,567	1,069
Monetary damages from air pollution - Gas Stations (million $2019)		159	161	155	139	109	74.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		288	265	234	191	139	90
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		144	140	134	117	86.9	53.8
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.6	38	37.7	34.7	28	20.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		312	306	289	252	198	143
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.5	70.5	59.6	48.3	38.8	30.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	21	19	16.8	14.7	12.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.1	5.94	5.95	5.91	5.93	5.73

Table 17: *E- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		478	413	330	268	224	162

Table 18: *E- scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		60.7	77.8	29.7	19.1	17.3	337
By economic sector - Construction (jobs)		8,322	7,156	7,966	7,517	10,357	19,094
By economic sector - Manufacturing (jobs)		2,032	2,814	2,456	2,284	3,642	5,191
By economic sector - Mining (jobs)		1,399	963	704	501	338	187
By economic sector - Other (jobs)		1,225	1,089	1,231	1,323	1,735	2,800
By economic sector - Pipeline (jobs)		305	253	345	186	157	168
By economic sector - Professional (jobs)		3,448	3,039	3,237	3,374	4,642	8,567
By economic sector - Trade (jobs)		2,557	2,183	2,302	2,361	3,112	5,363
By economic sector - Utilities (jobs)		5,821	5,472	6,537	6,256	10,245	22,280
By resource sector - Biomass (jobs)		230	209	98.5	80.3	73.6	1,389
By resource sector - CO2 (jobs)		0	0	1,123	96	124	559
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		6,992	7,484	9,159	9,614	18,360	43,192
By resource sector - Natural Gas (jobs)		3,270	2,400	1,980	1,889	1,517	1,619
By resource sector - Nuclear (jobs)		923	908	894	880	866	853
By resource sector - Oil (jobs)		3,110	2,602	2,182	1,740	1,309	787
By resource sector - Solar (jobs)		9,517	8,563	8,527	8,251	9,558	12,439
By resource sector - Wind (jobs)		324	668	845	1,271	2,437	3,148
By education level - All sectors - High school diploma or less (jobs)		10,716	9,823	10,581	10,099	14,561	27,365
By education level - All sectors - Associates degree or some college (jobs)		7,966	7,309	7,969	7,652	11,108	20,844
By education level - All sectors - Bachelors degree (jobs)		5,056	4,621	4,885	4,721	6,680	12,270
By education level - All sectors - Masters or professional degree (jobs)		1,245	1,129	1,202	1,178	1,666	3,097
By education level - All sectors - Doctoral degree (jobs)		186	164	172	172	230	411
Related work experience - All sectors - None (jobs)		3,651	3,343	3,626	3,477	5,017	9,451
Related work experience - All sectors - Up to 1 year (jobs)		5,076	4,660	4,982	4,791	6,861	12,760
Related work experience - All sectors - 1 to 4 years (jobs)		9,046	8,270	8,899	8,554	12,292	22,982
Related work experience - All sectors - 4 to 10 years (jobs)		5,877	5,365	5,798	5,558	7,992	14,932
Related work experience - All sectors - Over 10 years (jobs)		1,518	1,408	1,504	1,442	2,084	3,862
On-the-Job Training - All sectors - None (jobs)		1,403	1,272	1,354	1,307	1,833	3,341
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,319	15,026	16,052	15,445	22,197	41,370
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,385	4,910	5,362	5,126	7,424	13,983
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,812	1,609	1,798	1,715	2,473	4,730
On-the-Job Training - All sectors - Over 10 years (jobs)		250	230	243	229	319	562
On-Site or In-Plant Training - All sectors - None (jobs)		4,092	3,745	4,002	3,852	5,475	10,075
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,864	13,669	14,634	14,073	20,249	37,807

Table 18: *E- scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,168	3,806	4,145	3,965	5,740	10,802
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,828	1,626	1,806	1,720	2,470	4,705
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		218	199	221	212	311	597
Wage income - All (million $2019)		1,454	1,345	1,467	1,428	2,083	3,969

Table 19: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	449	421	386	356	331	302	268
Final energy use - Residential (PJ)	241	229	222	214	200	183	167
Final energy use - Commercial (PJ)	189	189	186	183	177	171	167
Final energy use - Industry (PJ)	130	132	133	143	154	162	170

Table 20: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.54	2.53	3.68	3.81	5.55	5.88

Table 21: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	50.7	151	250	713	1,176	2,200	3,224
Vehicle stocks - LDV – All others (1000 units)	4,214	4,214	4,214	3,998	3,781	2,914	2,046
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	133	271	925	2,883	4,210
Public EV charging plugs - DC Fast (1000 units)	0.402		0.44		2.06		5.66
Public EV charging plugs - L2 (1000 units)	1.67		10.6		49.6		136

Table 22: *E- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	17.4	27.2	32.2	46.7	68.8	83.3	88.3
Sales of space heating units - Electric Resistance (%)	13.2	15.3	14.3	11.6	7.67	5.11	4.2
Sales of space heating units - Gas (%)	55.1	36	33.4	26	14.6	7.13	4.52
Sales of space heating units - Fossil (%)	14.3	21.5	20.1	15.7	8.92	4.46	2.92
Sales of water heating units - Electric Heat Pump (%)	0	1.58	6.08	19	38.9	51.9	56.4
Sales of water heating units - Electric Resistance (%)	35.7	52.7	51.6	48.7	44.3	41.5	40.5
Sales of water heating units - Gas Furnace (%)	59.5	42.2	38.9	29.2	14.4	4.62	1.21
Sales of water heating units - Other (%)	4.77	3.53	3.4	3	2.4	2.02	1.89
Sales of cooking units - Electric Resistance (%)	59	60.1	63.8	73.7	87.5	96	98.9
Sales of cooking units - Gas (%)	41	39.9	36.2	26.3	12.5	4.04	1.09
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.72				

Table 23: *E- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.22	20.1	24.9	38.9	61	76.7	82.8
Sales of space heating units - Electric Resistance (%)	2.54	8.05	8.31	9.13	10.6	12	12.8
Sales of space heating units - Gas (%)	84.3	67	62.3	48.5	26.7	10.8	4.34
Sales of space heating units - Fossil (%)	11	4.85	4.51	3.43	1.69	0.531	0.139
Sales of water heating units - Electric Heat Pump (%)	0.097	2.03	7.02	21.4	43.5	57.9	63
Sales of water heating units - Electric Resistance (%)	2.5	7.39	9.34	15.1	24	29.8	31.8
Sales of water heating units - Gas (%)	93	86.1	79.2	59.6	29.2	9.38	2.45
Sales of water heating units - Other (%)	4.44	4.46	4.4	3.91	3.31	2.91	2.76
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,752	24,163				

Table 24: *E- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,858	6,858	6,858	6,070	6,167	7,743
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	1,829	1,829	1,829	1,829

Table 25: *E- scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240

Table 25: *E- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61

Table 25: *E- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

Table 26: *E- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0

Table 26: *E- scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

Table 27: *E+RE+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		25.7	18	11.2	7.87	2.76	0.525
Premature deaths from air pollution - Mobile - On-Road (deaths)		246	229	173	100	44.8	16.5
Premature deaths from air pollution - Gas Stations (deaths)		17.5	16.1	12	6.99	3.22	1.34
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.2	26.2	17.3	9.45	4.49	1.96
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16	13	8.78	5	2.15	0.668

Table 27: *E+RE+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.19	3.77	2.93	2	1.18	0.679
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35	30	21.2	12.8	7.49	4.58
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.17	7.3	5.23	3.42	2.23	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.21	1.83	1.44	1.06	0.704
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.26	0.672	0.669	0.661	0.67	0.63
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		52.7	48.2	38.9	27.5	15.3	1.37
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		228	159	99	69.7	24.4	4.65
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,187	2,036	1,542	889	398	147
Monetary damages from air pollution - Gas Stations (million $2019)		155	142	106	61.9	28.6	11.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		286	232	154	83.8	39.8	17.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		142	115	77.8	44.3	19.1	5.92
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.1	33.4	25.9	17.7	10.5	6.02
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		310	265	188	113	66.3	40.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.2	64.6	46.3	30.2	19.8	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	19.6	16.2	12.7	9.42	6.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		11.1	5.93	5.9	5.83	5.91	5.56
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		468	428	345	244	136	12.1

Table 28: *E+RE+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		50.1	104	38.4	24.5	19.8	336
By economic sector - Construction (jobs)		8,263	6,039	8,057	9,465	16,290	21,122
By economic sector - Manufacturing (jobs)		2,300	2,742	3,850	3,274	4,510	5,869
By economic sector - Mining (jobs)		1,375	901	541	282	116	16.5
By economic sector - Other (jobs)		1,207	839	1,303	1,675	2,548	5,020
By economic sector - Pipeline (jobs)		296	246	172	108	57.7	23.4
By economic sector - Professional (jobs)		3,428	2,688	3,488	4,253	7,088	10,610
By economic sector - Trade (jobs)		2,533	1,874	2,346	2,794	4,506	7,188
By economic sector - Utilities (jobs)		5,919	5,325	6,702	7,945	17,232	15,240
By resource sector - Biomass (jobs)		195	293	103	80	73.4	1,479
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		7,287	7,172	10,833	13,823	34,407	29,633
By resource sector - Natural Gas (jobs)		3,168	2,460	1,996	2,118	1,518	1,511
By resource sector - Nuclear (jobs)		923	908	710	258	0	0
By resource sector - Oil (jobs)		3,072	2,376	1,606	924	407	0.019
By resource sector - Solar (jobs)		9,582	6,596	9,854	10,336	12,355	29,084
By resource sector - Wind (jobs)		339	741	1,394	2,280	3,607	3,717
By education level - All sectors - High school diploma or less (jobs)		10,801	8,809	11,312	12,691	22,363	27,811
By education level - All sectors - Associates degree or some college (jobs)		8,037	6,576	8,523	9,701	17,186	21,253
By education level - All sectors - Bachelors degree (jobs)		5,096	4,202	5,208	5,780	9,974	12,641
By education level - All sectors - Masters or professional degree (jobs)		1,251	1,024	1,272	1,442	2,510	3,233
By education level - All sectors - Doctoral degree (jobs)		186	146	180	206	336	486
Related work experience - All sectors - None (jobs)		3,678	3,009	3,853	4,368	7,723	9,631
Related work experience - All sectors - Up to 1 year (jobs)		5,116	4,166	5,372	6,017	10,445	13,410
Related work experience - All sectors - 1 to 4 years (jobs)		9,117	7,465	9,481	10,674	18,788	23,381
Related work experience - All sectors - 4 to 10 years (jobs)		5,924	4,841	6,164	6,958	12,250	15,127
Related work experience - All sectors - Over 10 years (jobs)		1,536	1,278	1,625	1,802	3,161	3,874
On-the-Job Training - All sectors - None (jobs)		1,410	1,135	1,437	1,608	2,742	3,610
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,468	13,572	17,261	19,289	33,736	42,414
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,426	4,417	5,683	6,467	11,508	14,029
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,814	1,431	1,852	2,171	3,911	4,756
On-the-Job Training - All sectors - Over 10 years (jobs)		252	204	262	285	470	615
On-Site or In-Plant Training - All sectors - None (jobs)		4,123	3,364	4,289	4,808	8,275	10,652
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,997	12,341	15,708	17,580	30,840	38,608
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,201	3,423	4,403	4,997	8,882	10,861
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,831	1,451	1,861	2,164	3,880	4,712
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		220	180	235	272	492	591
Wage income - All (million $2019)		1,465	1,218	1,559	1,777	3,187	3,968

Table 29: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167

Table 30: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.99	3.04	6	6.39	5.4	5.63

Table 31: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	65.5	406	746	1,938	3,129	4,082	5,034
Vehicle stocks - LDV – All others (1000 units)	4,197	3,997	3,796	2,766	1,737	983	228
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		800	2,073	3,321	5,046	5,475	5,229
Public EV charging plugs - DC Fast (1000 units)	0.402		1.31		5.5		8.84
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212

Table 32: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Sales of space heating units - Electric Resistance (%)	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35
Sales of water heating units - Electric Heat Pump (%)	0	9.19	48.7	57.6	58	58	58
Sales of water heating units - Electric Resistance (%)	35.7	51	42.2	40.3	40.2	40.2	40.2
Sales of water heating units - Gas Furnace (%)	59.5	36.5	7.04	0.317	0.002	0	0
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84
Sales of cooking units - Electric Resistance (%)	59.2	67.9	94.5	99.7	100	100	100
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.71				

Table 33: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.22	28.1	70.4	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.3	18.3	3.58	1.9	1.86	1.85
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Sales of water heating units - Electric Resistance (%)	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Sales of water heating units - Gas (%)	93	74.5	14.3	0.646	0.003	0	0
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71

Table 33: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,776	24,347				

Table 34: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,754	6,982	7,583	9,493	9,207	10,165
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	911	0	0	0
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	972	4,354	4,700	6,660	9,052	12,770	28,882
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	1,394	4,802
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	987	12,663	15,370
Installed renewables - Solar - Constrained land use assumptions (MW)	1,309	3,030	4,675	7,213	8,857	9,127	28,742
Installed renewables - Wind - Constrained land use assumptions (MW)	219	219	219	1,831	3,540	3,540	3,540
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	989	989	15,372
Capital invested - Solar PV - Base (billion $2018)		4.53	0.414	2.16	2.49	3.65	14.9
Capital invested - Wind - Base (billion $2018)		0	0	0	0	2.43	6.5
Capital invested - Offshore Wind - Base (billion $2018)		0	0	0	1.71	17.2	3.59

Table 35: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,833	8,064	8,720	12,261	16,434	22,811	52,725
Wind - Base land use assumptions (GWh)	786	786	786	786	786	4,950	14,593
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	4,268	58,926	72,114
Solar - Constrained land use assumptions (GWh)	4,898	11,221	17,264	26,520	32,278	33,228	105,973
Wind - Constrained land use assumptions (GWh)	1,572	1,572	1,572	12,555	21,470	21,470	21,470
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	8,552	8,552	144,242

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

Table 37: *E+RE+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7

Table 37: *E+RE+ scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

Table 38: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.9	18	23.2	17.7	6.19	1.89
Premature deaths from air pollution - Mobile - On-Road (deaths)		246	229	173	100	44.8	16.5
Premature deaths from air pollution - Gas Stations (deaths)		17.5	16.1	12	6.99	3.22	1.34
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.2	26.2	17.3	9.45	4.49	1.96
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16	13	8.78	5	2.15	0.668
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.19	3.77	2.93	2	1.18	0.679
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35	30	21.2	12.8	7.49	4.58
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.17	7.3	5.23	3.42	2.23	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.21	1.83	1.44	1.06	0.704
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.09	0.671	0.669	0.661	0.671	0.63
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		55	52.4	51	44.8	37.6	28.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		202	159	206	157	54.8	16.7
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,187	2,036	1,542	889	398	147
Monetary damages from air pollution - Gas Stations (million $2019)		155	142	106	61.9	28.6	11.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		286	232	154	83.8	39.8	17.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		142	115	77.8	44.3	19.1	5.92
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.1	33.4	25.9	17.7	10.5	6.02

Table 38: *E+RE- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		310	265	188	113	66.3	40.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.2	64.6	46.3	30.2	19.8	12.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	19.6	16.2	12.7	9.42	6.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		9.65	5.92	5.91	5.83	5.92	5.56
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		489	466	453	398	334	251

Table 39: *E+RE- scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		57	81.6	27.3	22.5	20.7	337
By economic sector - Construction (jobs)		5,240	4,938	6,370	5,967	6,631	8,456
By economic sector - Manufacturing (jobs)		1,623	1,545	1,554	1,344	1,651	1,514
By economic sector - Mining (jobs)		1,399	943	634	402	248	159
By economic sector - Other (jobs)		661	685	857	958	1,073	1,796
By economic sector - Pipeline (jobs)		311	270	392	212	172	199
By economic sector - Professional (jobs)		2,303	2,124	2,559	2,573	3,726	4,827
By economic sector - Trade (jobs)		1,842	1,593	1,753	1,748	2,164	2,953
By economic sector - Utilities (jobs)		4,462	4,136	6,726	5,868	12,117	10,636
By resource sector - Biomass (jobs)		199	209	93.5	84.1	81.2	1,401
By resource sector - CO2 (jobs)		0	0	1,268	109	140	632
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		4,794	4,829	7,847	8,252	10,016	10,288
By resource sector - Natural Gas (jobs)		2,817	2,428	2,303	2,376	2,385	2,458
By resource sector - Nuclear (jobs)		923	908	1,846	1,072	8,122	5,483
By resource sector - Oil (jobs)		3,071	2,410	1,678	1,089	708	484
By resource sector - Solar (jobs)		4,979	4,910	5,424	5,588	5,721	9,486
By resource sector - Wind (jobs)		314	408	412	524	629	644
By education level - All sectors - High school diploma or less (jobs)		7,546	6,907	8,806	8,068	11,173	12,705
By education level - All sectors - Associates degree or some college (jobs)		5,600	5,132	6,689	6,161	8,669	9,708
By education level - All sectors - Bachelors degree (jobs)		3,715	3,337	4,193	3,782	6,146	6,510
By education level - All sectors - Masters or professional degree (jobs)		906	819	1,039	949	1,584	1,694
By education level - All sectors - Doctoral degree (jobs)		132	119	146	135	232	259
Related work experience - All sectors - None (jobs)		2,585	2,368	3,045	2,797	3,942	4,468
Related work experience - All sectors - Up to 1 year (jobs)		3,550	3,253	4,117	3,789	5,407	6,174
Related work experience - All sectors - 1 to 4 years (jobs)		6,477	5,884	7,517	6,870	10,094	11,134
Related work experience - All sectors - 4 to 10 years (jobs)		4,192	3,813	4,913	4,481	6,577	7,208

Table 39: *E+RE- scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Over 10 years (jobs)		1,096	996	1,280	1,158	1,783	1,891
On-the-Job Training - All sectors - None (jobs)		995	904	1,136	1,037	1,589	1,760
On-the-Job Training - All sectors - Up to 1 year (jobs)		11,692	10,633	13,471	12,315	18,172	20,148
On-the-Job Training - All sectors - 1 to 4 years (jobs)		3,795	3,473	4,540	4,155	5,906	6,526
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,244	1,145	1,524	1,408	1,871	2,152
On-the-Job Training - All sectors - Over 10 years (jobs)		174	160	201	180	266	290
On-Site or In-Plant Training - All sectors - None (jobs)		2,897	2,644	3,355	3,066	4,578	5,090
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		10,641	9,677	12,297	11,241	16,545	18,318
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,941	2,690	3,498	3,204	4,540	5,033
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,269	1,164	1,536	1,411	1,916	2,175
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		152	140	185	172	225	260
Wage income - All (million $2019)		1,046	962	1,254	1,156	1,785	1,959

Table 40: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167

Table 41: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.99	3.04	6	6.39	5.4	5.63

Table 42: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	65.5	406	746	1,938	3,129	4,082	5,034
Vehicle stocks - LDV – All others (1000 units)	4,197	3,997	3,796	2,766	1,737	983	228
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		800	2,073	3,321	5,046	5,475	5,229
Public EV charging plugs - DC Fast (1000 units)	0.402		1.31		5.5		8.84
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212

Table 43: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Sales of space heating units - Electric Resistance (%)	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35

Table 43: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	9.19	48.7	57.6	58	58	58
Sales of water heating units - Electric Resistance (%)	35.7	51	42.2	40.3	40.2	40.2	40.2
Sales of water heating units - Gas Furnace (%)	59.5	36.5	7.04	0.317	0.002	0	0
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84
Sales of cooking units - Electric Resistance (%)	59.2	67.9	94.5	99.7	100	100	100
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.71				

Table 44: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.22	28.1	70.4	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Gas (%)	84.3	59.3	18.3	3.58	1.9	1.86	1.85
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Sales of water heating units - Electric Resistance (%)	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Sales of water heating units - Gas (%)	93	74.5	14.3	0.646	0.003	0	0
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,776	24,347				

Table 45: *E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	4,024	4,495	4,735	4,787	7,975	5,063
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	2,228	2,228	5,292	6,619
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	569	1,405	2,106	2,586	2,865	2,865	2,865
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Solar - Constrained land use assumptions (MW)	713	1,607	2,761	2,915	3,761	3,963	3,963
Installed renewables - Wind - Constrained land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	260	582
Capital invested - Solar PV - Base (billion $2018)		1.12	0.84	0.53	0.29	0	0
Capital invested - Wind - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		1.2	1.38	0.17	0.879	0.198	0
Capital invested - Wind - Constrained (billion $2018)		0	0	0	0	0	0

Table 45: *E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Constrained (billion $2018)		0	0	0	0	0.383	0.427

Table 46: *E+RE- scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,078	2,619	3,931	4,822	5,347	5,347	5,347
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,345	3,008	5,115	5,408	6,969	7,338	7,338
Wind - Constrained land use assumptions (GWh)	786	786	786	786	786	786	786
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	1,098	2,486

Table 47: *E+RE- scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401

Table 47: *E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8

Table 47: *E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

Table 48: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-313
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-14.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-327

Table 48: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-595
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-624
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							276
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							26.4
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							302
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							525
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							52.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							578

Table 49: *E-B+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		27.2	16.8	9.67	7.59	4.48	1.32
Premature deaths from air pollution - Mobile - On-Road (deaths)		251	254	247	222	176	120
Premature deaths from air pollution - Gas Stations (deaths)		18	18.2	17.5	15.7	12.4	8.42
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32.5	29.9	26.4	21.5	15.7	10.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		16.3	15.7	15.2	13.3	9.81	6.08
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.25	4.29	4.26	3.91	3.16	2.31
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.8	1.72	1.63	1.54	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35.3	34.5	32.7	28.5	22.4	16.2

Table 49: *E-B+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.21	7.97	6.74	5.46	4.39	3.48
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.59	2.37	2.14	1.9	1.67	1.43
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.17	0.673	0.674	0.67	0.679	0.669
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		53.9	46.5	37.2	30.2	25.2	18.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		744	0.505	0.5	0.458	0.318	0.027
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		241	149	85.6	67.2	39.7	11.7
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,231	2,262	2,199	1,975	1,567	1,069
Monetary damages from air pollution - Gas Stations (million $2019)		159	161	155	139	109	74.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		288	265	234	191	139	90
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		144	140	134	117	86.9	53.8
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		37.6	38	37.7	34.7	28	20.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	15.9	15.2	14.4	13.6	12.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		312	306	289	252	198	143
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		81.5	70.5	59.6	48.3	38.8	30.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		23	21	19	16.8	14.7	12.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.3	5.94	5.95	5.91	5.99	5.9
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		478	413	330	268	224	162

Table 50: *E-B+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		55.5	77.8	29.1	21.5	17.8	388
By economic sector - Construction (jobs)		8,248	7,111	7,691	7,257	8,995	16,520
By economic sector - Manufacturing (jobs)		2,013	2,792	2,240	1,932	2,707	4,481
By economic sector - Mining (jobs)		1,395	962	708	524	337	175
By economic sector - Other (jobs)		1,213	1,081	1,171	1,229	1,503	2,554
By economic sector - Pipeline (jobs)		303	252	351	193	155	163
By economic sector - Professional (jobs)		3,421	3,025	3,115	3,242	4,016	7,638

Table 50: *E-B+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		2,541	2,173	2,223	2,276	2,718	4,760
By economic sector - Utilities (jobs)		5,772	5,433	6,401	6,461	9,070	18,743
By resource sector - Biomass (jobs)		221	209	98.4	90.2	82.6	1,830
By resource sector - CO2 (jobs)		0	0	1,152	98.6	127	574
By resource sector - Coal (jobs)		803	212	0	0	0	0
By resource sector - Grid (jobs)		6,934	7,418	8,848	9,674	15,607	35,778
By resource sector - Natural Gas (jobs)		3,220	2,382	1,996	2,268	1,809	1,563
By resource sector - Nuclear (jobs)		923	908	894	880	866	853
By resource sector - Oil (jobs)		3,110	2,602	2,182	1,830	1,319	734
By resource sector - Solar (jobs)		9,419	8,488	7,952	7,331	8,056	11,921
By resource sector - Wind (jobs)		331	687	807	966	1,652	2,171
By education level - All sectors - High school diploma or less (jobs)		10,624	9,763	10,200	9,792	12,530	23,699
By education level - All sectors - Associates degree or some college (jobs)		7,899	7,263	7,686	7,439	9,573	17,989
By education level - All sectors - Bachelors degree (jobs)		5,018	4,596	4,717	4,591	5,771	10,671
By education level - All sectors - Masters or professional degree (jobs)		1,235	1,122	1,162	1,148	1,445	2,699
By education level - All sectors - Doctoral degree (jobs)		185	163	166	166	200	365
Related work experience - All sectors - None (jobs)		3,620	3,323	3,499	3,385	4,331	8,187
Related work experience - All sectors - Up to 1 year (jobs)		5,033	4,632	4,795	4,621	5,889	11,102
Related work experience - All sectors - 1 to 4 years (jobs)		8,972	8,221	8,589	8,320	10,608	19,891
Related work experience - All sectors - 4 to 10 years (jobs)		5,829	5,332	5,597	5,411	6,900	12,907
Related work experience - All sectors - Over 10 years (jobs)		1,506	1,399	1,450	1,399	1,790	3,336
On-the-Job Training - All sectors - None (jobs)		1,392	1,265	1,305	1,263	1,582	2,917
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,185	14,936	15,473	14,974	19,098	35,896
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,340	4,879	5,178	4,996	6,413	12,049
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,796	1,599	1,741	1,683	2,153	4,072
On-the-Job Training - All sectors - Over 10 years (jobs)		248	228	233	220	273	489
On-Site or In-Plant Training - All sectors - None (jobs)		4,058	3,723	3,857	3,726	4,714	8,760
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,742	13,587	14,109	13,653	17,430	32,781
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,133	3,782	4,002	3,861	4,955	9,314
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,812	1,616	1,749	1,688	2,151	4,055
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		216	198	214	207	269	514
Wage income - All (million $2019)		1,442	1,337	1,417	1,392	1,801	3,433

Table 51: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	449	421	386	356	331	302	268
Final energy use - Residential (PJ)	241	229	222	214	200	183	167
Final energy use - Commercial (PJ)	189	189	186	183	177	171	167
Final energy use - Industry (PJ)	130	132	133	143	154	162	170

Table 52: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.54	2.53	3.68	3.81	5.55	5.88

Table 53: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	50.7	151	250	713	1,176	2,200	3,224
Vehicle stocks - LDV – All others (1000 units)	4,214	4,214	4,214	3,998	3,781	2,914	2,046
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	133	271	925	2,883	4,210
Public EV charging plugs - DC Fast (1000 units)	0.402		0.44		2.06		5.66
Public EV charging plugs - L2 (1000 units)	1.67		10.6		49.6		136

Table 54: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	17.4	27.2	32.2	46.7	68.8	83.3	88.3
Sales of space heating units - Electric Resistance (%)	13.2	15.3	14.3	11.6	7.67	5.11	4.2
Sales of space heating units - Gas (%)	55.1	36	33.4	26	14.6	7.13	4.52
Sales of space heating units - Fossil (%)	14.3	21.5	20.1	15.7	8.92	4.46	2.92
Sales of water heating units - Electric Heat Pump (%)	0	1.58	6.08	19	38.9	51.9	56.4
Sales of water heating units - Electric Resistance (%)	35.7	52.7	51.6	48.7	44.3	41.5	40.5
Sales of water heating units - Gas Furnace (%)	59.5	42.2	38.9	29.2	14.4	4.62	1.21
Sales of water heating units - Other (%)	4.77	3.53	3.4	3	2.4	2.02	1.89
Sales of cooking units - Electric Resistance (%)	59	60.1	63.8	73.7	87.5	96	98.9
Sales of cooking units - Gas (%)	41	39.9	36.2	26.3	12.5	4.04	1.09
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.8	4.72				

Table 55: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.22	20.1	24.9	38.9	61	76.7	82.8
Sales of space heating units - Electric Resistance (%)	2.54	8.05	8.31	9.13	10.6	12	12.8
Sales of space heating units - Gas (%)	84.3	67	62.3	48.5	26.7	10.8	4.34
Sales of space heating units - Fossil (%)	11	4.85	4.51	3.43	1.69	0.531	0.139
Sales of water heating units - Electric Heat Pump (%)	0.097	2.03	7.02	21.4	43.5	57.9	63
Sales of water heating units - Electric Resistance (%)	2.5	7.39	9.34	15.1	24	29.8	31.8
Sales of water heating units - Gas (%)	93	86.1	79.2	59.6	29.2	9.38	2.45
Sales of water heating units - Other (%)	4.44	4.46	4.4	3.91	3.31	2.91	2.76
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,752	24,163				

Table 56: *E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	0	0	0	0	0
Installed thermal - Natural gas (MW)	4,401	6,754	6,754	6,754	8,019	8,691	8,525
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	1,829	1,829	1,829	1,829
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

Table 57: *E-B+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

Table 58: *E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy*

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	6
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	0	0	5,252
Biomass purchases (million $2018/y)		0	0	0	0	0	476

Table 59: *E-B+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	3.32	3.42	3.53
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

Table 60: *E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	112	112	112	112
Spur (km)		0	0	0	85.1	85.1	145
All (km)		0	0	112	197	197	257
Cumulative investment - Trunk (million $2018)		0	0	667	667	667	667
Cumulative investment - Spur (million $2018)		0	0	0	81.3	82.7	153

Table 60: *E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative investment - All (million $2018)		0	0	667	748	749	820

Table 61: *E-B+ scenario - PILLAR 4: CCUS - CO2 storage*

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million $2020)		0	0	0	0	0	0
Wells and facilities construction costs (million $2020)		0	0	0	0	0	0

Table 62: *E-B+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101

Table 62: *E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8

Table 62: *E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130

Table 63: *E-B+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-140
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-276
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-12.6
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-429

Table 63: *E-B+ scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-140
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-526
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-25.2
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-691
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							66.5
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							243
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							22.9
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							24.8
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							15.5
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							372
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							66.5
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,142
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							45.8
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							24.8
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							15.5
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,295

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		219	138	129	125	123	113

Table 64: *REF scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.4	24.9	29.7	31.3	28.6	27.7
Premature deaths from air pollution - Mobile - On-Road (deaths)		250	257	263	270	277	283
Premature deaths from air pollution - Gas Stations (deaths)		17.9	18.3	18.6	19.1	19.5	19.8
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		32	29.9	28.6	28.2	28.4	28.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		15.5	13	9.13	5.83	3.47	2.18
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.07	4.04	4.06	4.15	4.24	4.32
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.96	1.97	1.97	1.97	1.96	1.94
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		35.6	35.1	32.9	30.3	29.4	30.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		9.39	8.57	7.62	6.65	6.11	5.85
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.71	2.81	2.91	3	3.08	3.16
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.1	1.57	1.34	1.29	1.27	1.21
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		54.3	58.7	61	58.3	58.6	56.5
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,940	1,219	1,141	1,109	1,088	998
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		199	221	263	277	254	246
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,223	2,284	2,337	2,400	2,459	2,517
Monetary damages from air pollution - Gas Stations (million $2019)		158	162	165	169	173	176
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		284	265	253	249	252	253
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		137	115	80.9	51.7	30.7	19.3
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		36	35.8	36	36.7	37.6	38.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		17.4	17.4	17.5	17.4	17.4	17.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		315	311	291	269	260	269
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		83.1	75.9	67.5	58.8	54.1	51.8

Table 64: *REF scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		24	24.9	25.8	26.5	27.3	28
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		18.6	13.8	11.8	11.4	11.2	10.6
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		482	521	542	518	521	502

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		52.7	47.2	46.7	38	37.9	41.1
By economic sector - Construction (jobs)		2,968	4,758	5,552	6,175	6,438	8,253
By economic sector - Manufacturing (jobs)		1,220	1,240	1,342	1,479	1,488	1,874
By economic sector - Mining (jobs)		1,413	1,143	932	761	646	512
By economic sector - Other (jobs)		144	562	718	866	970	1,690
By economic sector - Pipeline (jobs)		311	320	323	306	310	309
By economic sector - Professional (jobs)		1,620	2,112	2,394	2,685	2,805	3,706
By economic sector - Trade (jobs)		1,360	1,652	1,788	1,964	2,060	2,776
By economic sector - Utilities (jobs)		5,009	4,901	5,661	6,336	6,547	6,736
By resource sector - Biomass (jobs)		203	190	177	158	162	164
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		803	598	567	539	514	197
By resource sector - Grid (jobs)		5,499	5,656	7,418	8,683	9,315	10,024
By resource sector - Natural Gas (jobs)		3,363	3,132	3,254	3,696	3,527	3,338
By resource sector - Nuclear (jobs)		923	908	710	438	431	425
By resource sector - Oil (jobs)		3,128	2,658	2,331	2,159	2,061	1,993
By resource sector - Solar (jobs)			3,365	4,054	4,605	4,941	9,091
By resource sector - Wind (jobs)		179	229	246	331	351	664
By education level - All sectors - High school diploma or less (jobs)		5,784	7,030	7,924	8,716	9,023	10,987
By education level - All sectors - Associates degree or some college (jobs)		4,403	5,280	5,990	6,647	6,885	8,381
By education level - All sectors - Bachelors degree (jobs)		3,066	3,457	3,779	4,092	4,204	5,071
By education level - All sectors - Masters or professional degree (jobs)		746	849	933	1,014	1,045	1,273
By education level - All sectors - Doctoral degree (jobs)		99	120	130	141	145	185
Related work experience - All sectors - None (jobs)		2,041	2,433	2,745	3,033	3,141	3,824
Related work experience - All sectors - Up to 1 year (jobs)		2,648	3,269	3,674	4,034	4,178	5,171
Related work experience - All sectors - 1 to 4 years (jobs)		5,175	6,072	6,786	7,448	7,695	9,318
Related work experience - All sectors - 4 to 10 years (jobs)		3,350	3,938	4,411	4,850	5,005	6,041
Related work experience - All sectors - Over 10 years (jobs)		884	1,024	1,139	1,245	1,283	1,543
On-the-Job Training - All sectors - None (jobs)		755	914	1,011	1,100	1,137	1,416
On-the-Job Training - All sectors - Up to 1 year (jobs)		9,267	10,891	12,149	13,310	13,751	16,724
On-the-Job Training - All sectors - 1 to 4 years (jobs)		2,997	3,585	4,057	4,487	4,641	5,602
On-the-Job Training - All sectors - 4 to 10 years (jobs)		955	1,189	1,365	1,523	1,579	1,912

Table 65: *REF scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		124	157	174	189	195	243
On-Site or In-Plant Training - All sectors - None (jobs)		2,230	2,680	2,988	3,275	3,382	4,166
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		8,441	9,928	11,087	12,153	12,558	15,254
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,317	2,772	3,134	3,463	3,582	4,331
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		990	1,211	1,379	1,532	1,586	1,911
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		121	145	168	188	195	235
Wage income - All (million $2019)		849	997	1,127	1,251	1,308	1,592

Table 66: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	449	422	391	372	373	384	398
Final energy use - Residential (PJ)	241	228	225	225	227	233	239
Final energy use - Commercial (PJ)	189	191	193	193	194	199	210
Final energy use - Industry (PJ)	130	136	143	150	159	169	180

Table 67: *REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.72	2.74	4.82	5.09	5.1	5.33

Table 68: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	15	40.3	41.5	42.8	43.7	44.6	45.9
Sales of space heating units - Electric Resistance (%)	13.7	12.7	12.4	12	11.7	10.8	9.45
Sales of space heating units - Gas (%)	56.6	31	38.4	41.1	40.8	40.8	40.9
Sales of space heating units - Fossil (%)	14.7	16.1	7.71	4.03	3.79	3.76	3.81
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	35.7	53	53	52.9	52.9	52.8	52.8
Sales of water heating units - Gas Furnace (%)	59.5	43.4	43.4	43.5	43.5	43.6	43.6
Sales of water heating units - Other (%)	4.77	3.57	3.58	3.59	3.6	3.6	3.61
Sales of cooking units - Electric Resistance (%)	58.7	58.7	58.7	58.7	58.7	58.7	58.7
Sales of cooking units - Gas (%)	41.3	41.3	41.3	41.3	41.3	41.3	41.3
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.7	4.34				

Table 69: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.22	24.1	48.5	68.5	71.8	72.2	72.1
Sales of space heating units - Electric Resistance (%)	2.54	8.78	12.8	20.1	25.2	25.9	26
Sales of space heating units - Gas (%)	84.3	62.4	35.2	9.92	2.85	1.92	1.85
Sales of space heating units - Fossil (%)	11	4.72	3.48	1.49	0.219	0.018	0

Table 69: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0.097	0.269	0.266	0.268	0.269	0.268	0.269
Sales of water heating units - Electric Resistance (%)	2.5	6.69	6.63	6.64	6.67	6.65	6.66
Sales of water heating units - Gas (%)	93	88.5	88.5	88.6	88.5	88.5	88.6
Sales of water heating units - Other (%)	4.44	4.5	4.6	4.5	4.54	4.55	4.51
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		21,455	22,311				

Table 70: *REF scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	2,851	1,599	1,599	1,599	1,599	1,599	0
Installed thermal - Natural gas (MW)	4,401	7,065	7,065	7,582	9,862	11,289	11,129
Installed thermal - Nuclear (MW)	1,829	1,829	1,829	911	911	911	911
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	389	389	389	389	389	389	389
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	0	1,551
Installed renewables - Solar - Constrained land use assumptions (MW)	4.27	4.27	4.27	4.27	4.27	4.27	4.27

Table 71: *REF scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	758	758	758	758	758	758	758
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

Table 72: *REF scenario - PILLAR 6: Land sinks - Forests - REF only*

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-4.41		-2.14				-1.92
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.235		-0.423				-0.44
Business-as-usual carbon sink - Total (Mt CO2e/y)	-4.65		-2.57				-2.36

Table 73: *REF scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-183
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-511
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-288

Table 73: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-125
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-31.1
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-67.1
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,480
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-28.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-642
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-922
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-104
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-576
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-240
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.6
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-365
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,401
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,332
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-140
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-864
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-356
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-62.1
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-886
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-5,324
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-546
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260

Table 73: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)		45					25.8
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.15
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							149
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.5
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

Table 73: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130